Poster

New multicomponent systems of the anti-cancer drug erlotynib

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Multicomponent pharmaceutical crystals are composed of two or more substances, at least one of which is pharmaceutically active (*Active Pharmaceutical Ingredients*, API). In such crystals, the drug molecule remains chemically unchanged (cocrystals, solvates) or is ionized (salts), and is combined with the molecule(s) of another compound through non-covalent interactions. This changes the physicochemical properties of the API and may therefore contribute to changes in the pharmaceutical properties of the drug [1]. Therefore, there is a constant search for new forms of known drugs, and one of the newest methods is to obtain stable and repeatable multicomponent systems. Due to the intrinsic correlation between crystal structure and physicochemical properties, an in-depth structural characterization of the new system is necessary, in particular to distinguish between the formation of a given polymorphic, solvatomorphic variant, salt or cocrystal of the same API [2].

The aim of this project is the structural analysis of new multicomponent systems containing a sparingly soluble pharmacologically active substance (erlotinib, ER). Special attention will be devoted to the relevance and type of intermolecular interactions in cocrystals/ionic-cocrystals formation. The solid-state NMR technique provides information about the near vicinity of the studied atoms in a complementary way to the data obtained from diffraction techniques, which are based on long-range order and require a single crystal to be obtained, which is often difficult to achieve.

ER is the drug used to treat non-small cell lung cancer and several other manifestations of the disease including pancreatic cancer [3]. It is a Class II drug according to the Biopharmaceutical Classification System (BCS) [4], and is characterized by low solubility and high permeability. Even the marketed hydrochloride salt, the most stable form B, exhibits solubility only up to 0.4 mg L−1 in pH ≃ 2 medium [5].

In this work we present a method of a synthesis of three new multicomponent systems and their structural and pharmaceutical studies. High-resolution solid state NMR spectroscopy (^{13}C, ^{15}N CP/MAS NMR), Fourier transformed infrared spectroscopy and powder X-ray diffraction were used to provide information about the formation of multicomponent systems of ER. Outcomes of spectroscopic studies were in great agreement with results of crystallographic research. Structural studies were completed with solubility tests. Solubility research show that newly obtained multicomponent crystals ER exhibit up to two times higher solubility than their parent drug. We expect that the results obtained in this project will constitute a solid basis for further research, which in turn may contribute to the development of new, stable and better soluble forms of this drug in the near future.

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